Title: Baseballapalooza

Brief Overview:

This activity integrates geometric problem-solving with architecture and design. Students will design a baseball field within given criteria and then persuade a local organization to fund the project. Students will be assessed continuously throughout the project.

Link to Standards:

- **Problem Solving** Students will demonstrate their ability to solve problems in mathematics including problems with open-ended answers, problems which are solved in a cooperative atmosphere, and problems which are solved with the use of technology.
- **Communication** Students will demonstrate their ability to communicate mathematically. They will read, write, and discuss mathematics with language and the signs, symbols, and terms of the discipline.
- **Reasoning** Students will demonstrate their ability to reason mathematically. They will make conjectures, gather evidence, and build arguments.
- **Connections** Students will demonstrate their ability to connect mathematical topics within the discipline and with other disciplines.
- **Number Concepts and Relationships** Students will demonstrate their ability to apply estimation strategies in computation, with the use of technology, in measurement, and in problem solving. They will determine the reasonableness of solutions. Students will demonstrate their ability to solve problems using arithmetic operations, with technology where appropriate.
- **Measurement** Students will demonstrate and apply concepts of measurement using non-standard and standard units and metric and customary units. They will estimate and verify measurements. They will apply measurement to interdisciplinary and real-world problem-solving situations.

Grade/Level:

Grades 4 - 6

Duration/Length:

One week should be allocated for this lesson. Depending on ability level of the students, the unit may take longer.

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Area and perimeter
- Customary units of measurement
- Coordinate graphing

Objectives:

Students will:

- choose an appropriate operation to solve a problem.
- solve problems involving money.
- add whole numbers.
- understand the meaning of operations.
- be able to use various strategies to solve problems.
- measure perimeter of polygons.
- measure area of polygons.
- describe development of area and perimeter.
- distinguish between area and perimeter.
- select the appropriate unit of measurement and the tool to find the measurement.
- apply measurement to interdisciplinary and real-world problem-solving situations.
- define, identify, and measure angles.
- construct a circle given its radius.
- define and identify points and construct line segments.
- locate places using coordinate graphing.

Materials/Resources/Printed Materials:

- The poem "Casey at the Bat" by Ernest Thayer, Jr.
- Large one inch grid paper or approximately 8 sheets of Teacher Resource #1 per group
- Compass
- Ruler
- Protractor
- Calculators
- Markers
- Pencils
- Student worksheet

Development/Procedures - Performance Assessment

Day 1:

- Read "Casey at the Bat" by Ernest Thayer Jr.
- Distribute and discuss Student Resource #1 "Mudville Mania".
- Divide the students into cooperative groups of 3 or 4.
- Distribute rulers, compasses, protractors, calculators, markers, and one piece of large one inch grid paper for each group. (We suggest having a box with supplies in it)
- Explain that the baseball field must be built within a rectangular field that is 250 feet by 310 feet.
- Generate a discussion to show the importance of using a scale when making a blueprint. If possible, obtain a blueprint of the school grounds to share with the students.
- Lead a discussion to decide the most appropriate scale size, keeping in mind the size of the materials. (The scale size 1 inch = l0 feet is most appropriate)
- Have the students use rulers and measure the dimensions of the rectangular (250' x 310') field and use marker to outline the field.
- Have the students measure the perimeter and area of the rectangular field and write a number sentence explaining how they arrived at their answer.

Day 2:

- Review radius, diameter, and circles.
- Distribute and discuss Student Resource #2 "We're Having a Ball".
- Distribute compasses to students and model the construction of a circle on an overhead projector.
- Have students complete "We're Having a Ball".
- Distribute project kits and have students remove grid paper and compasses.
- Instruct students to locate coordinate square (16,7) and place a point in the center of the square. Label this point A.
- Instruct students to locate coordinate square (16,1) and place a point in the center of the square. Label this point B. (Note: If your students are not familiar with coordinate graphing, you may place points A & B on the grid paper prior to instruction.)
- Instruct the students to use a compass to draw a circle to scale representing a radius of five feet at point A (use the marking on the compass). This is the pitcher's mound. Draw another circle with a radius of 5 feet at point B. This is the catcher's circle.
- Instruct the students to locate coordinate square (13,4) and place a point in the center of the square. Label this point C. Next locate coordinate square (19,4) and place a point in the center of the square. Label this point D.

Day 3:

- Review points and line segments.
- Distribute and discuss Student Resource #3 "Making a Fine Catch".
- Distribute rulers to students and have them complete resource page #3.
- Distribute project kits and have students remove grid paper and rulers.
- Instruct students to draw a line segment beginning at point B passing through point C that represents 90 feet. Label this point E. This is third base. Draw a line segment beginning at point B passing through point D that represents 90 feet. Label this point F. This is first base.

Day 4:

- Review angles.
- Distribute and discuss Student Resource #4 "Hitting a Home Run".
- Distribute protractors and model measuring an angle on an overhead projector.
- Instruct students to complete resource page #4.
- Distribute project kits and have students take out grid paper, rulers, and protractors.
- Instruct students to construct a right angle at points E and F. Extend the line segments until they intersect. Label this intersection point G. This is second base.
- Instruct students to draw a line segment from point B through points C and E that represents 200 feet. Label this point H. This is the left field line. Draw a line segment from point B through points D and F that extends 200 feet. Label this point I. This is the right field line.
- Instruct students to draw a line segment from point B through points A and G that represents 240 feet. Label this point J. This is dead center field.
- Instruct students to construct a right angle at point H and another at point I. Extend a line from point H that represents 100 feet. Label this point K. Extend a line from point I that represents 100 feet. Label this point L.
- Instruct students to draw a line segment connecting points K and J. Draw a line segment connecting points L and J. This is your outfield fence.

Day 5:

- Review perimeter and area.
- Distribute and discuss student resources #5 and #6, "Big Bucks in Baseball"
- Instruct students to determine the cost of the outfield fence, player salary per game, and cost of sodding the field using data from resource page #5.
- Orally lead a class discussion having the students (using their grids) compare area and perimeter of the baseball field with the original rectangular field.
- Instruct students to write a persuasive letter to the P.T.A. convincing them that they should support the funding of the baseball field.

Evaluation:

Use the scoring rubric to assess students' blueprints. See Teacher Resource 7 for a completed ball field blueprint.

Students may also be evaluated upon the following:

- Group participation and performance
- Adherence to criteria of the project
- Successful completion of student resource sheets
- Attention to form, audience, topic, and purpose in their persuasive letter to the P.T.A.

Extensions/Follow-up

Math

- Build your blueprint into a model by adding 3-dimensional objects such as bases, foul poles, bleachers, scoreboard, and outfield fence.
- Determine batting averages for your favorite players on your favorite teams.
- Find a field on the campus of your school and actually make your baseball field.
- Figure out how much it would cost for a family of four to attend a game, given specific criteria such as ticket cost, parking, food, drink, etc.).

Science

- Design a test to determine student's reaction times.
- Experiment with what causes a curve ball to curve.

Social Studies / Geography

- Locate all major league stadiums on a map.

Language Arts

- Write a letter to your favorite major league team requesting information.
- Write a biography about a famous baseball player.

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Baseballapalooza Student Resource #1

"Mudville Mania"

Your school principal is interested in honoring the famous Mudville Nine by constructing a baseball field on campus. Your class has been asked to submit a plan for the baseball field. You will work in a group to develop and construct a blueprint for the new field. The blueprint should contain the following:

1) an infield with the proper dimensions of 90 feet between the bases
2) an outfield with dimensions of 200 feet down the right and left field lines and 240 feet to dead center field
3) an outfield fence that stretches from the right field line to the left field line
4) a scale showing distance used on the blueprint

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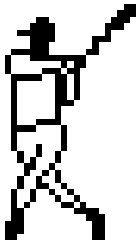
Scoring Rubric

Outstanding

- The baseball field has proper dimensions.
- The blueprint includes a scale.
- The blueprint is clean and neat.
- All angles and line segments are formed correctly.

High

- The baseball field has proper dimensions.
- The blueprint includes a scale.
- The blueprint is fairly clean and neat.
- Most angles and line segments are formed correctly.



Medium

- The baseball field has some proper dimensions.
- The blueprint includes a scale.
- The blueprint is legible.
- Some angles and line segments are formed correctly.

Low

- The baseball field has few proper dimensions.
- The blueprint may or may not include a scale.
- The blueprint is sloppy.
- Few angles and line segments are formed correctly.

Baseballapalooza Student Resource #2

"We're Having a Ball"

Sports use balls of many different sizes. Use your compass to draw circles that represent the sizes of the various balls.

Handball - 2 inch diameter

Baseball - approx. 3 inch diameter

Softball - approx. 4 inch diameter

*The circles represent the sizes of the balls. Explain how you used your compass to make the balls the proper size.

_____
_____
_____
_____

Baseballapalooza Student Resource #3

"Making a Fine Catch"

The outfielders in the game of baseball make many outstanding catches during the year. In order to catch the ball, sometimes they have to run great distances. Draw line segments connecting the players to where the ball is hit. Players l, 2, and 3 are at points A, B, and C when the ball is pitched.

(Player l)
B
•

F
•

D
•

(Player 2) A
•

C (Player 3)
•

•
E

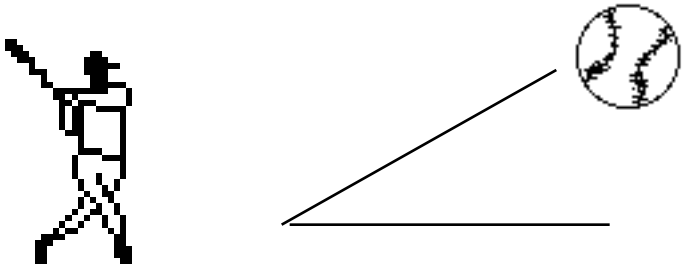
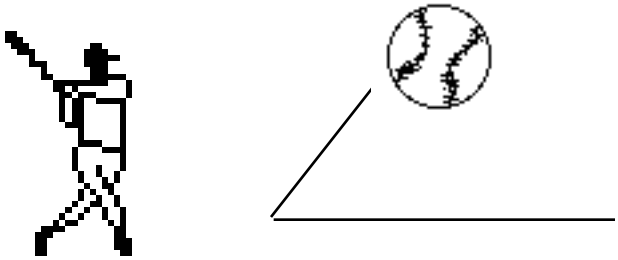
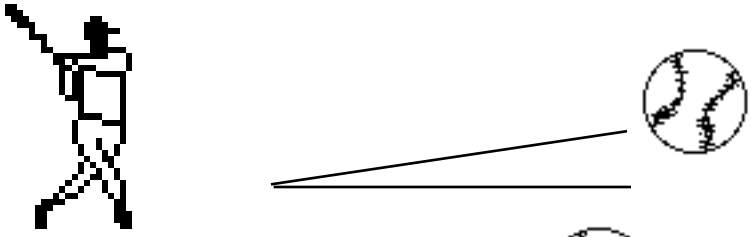
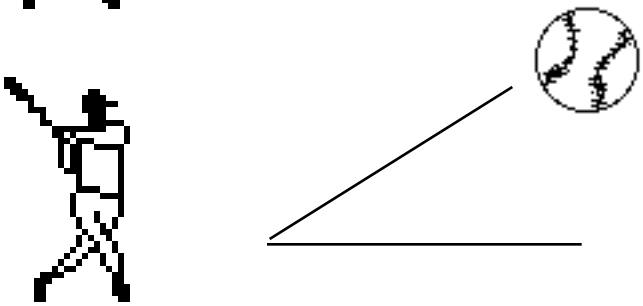
1) Players l and 2 chase after a ball hit to point D.
2) Players 2 and 3 chase after a ball hit to point E.
3) Players l and 3 chase after a ball hit to point F.
4) Explain what would happen if players 1 and 3 arrived at point F at the same time. Support your answer.

_____
_____
_____
_____
_____

Baseballapalooza Student Resource #4

"Hitting a Home Run"

The players below want to hit a home run. In order to hit a home run, the ball must come off the bat between an angle of 20 to 40 degrees. Using a protractor, measure the angles and tell if the players hit home runs.

	Angle measure	Home run? Yes/No
	_____	_____
	_____	_____
	_____	_____
	_____	_____

Baseballapalooza Student Resource #5

"Big Bucks in Baseball"

You are in charge of purchasing the fence for the outfield. The cost of the fence is $10.00 per l0 feet. How many feet of fence do you need to complete the outfield fence? How much will it cost?

Show your work:

Explain your answer.
_____
_____
_____
_____
_____
_____

Sod costs $8 per 10 sq. ft. section. Estimate the area of your baseball field and determine how much money it would cost to sod the entire field._____

Explain how you got your
estimates._____
_____
_____
_____
_____

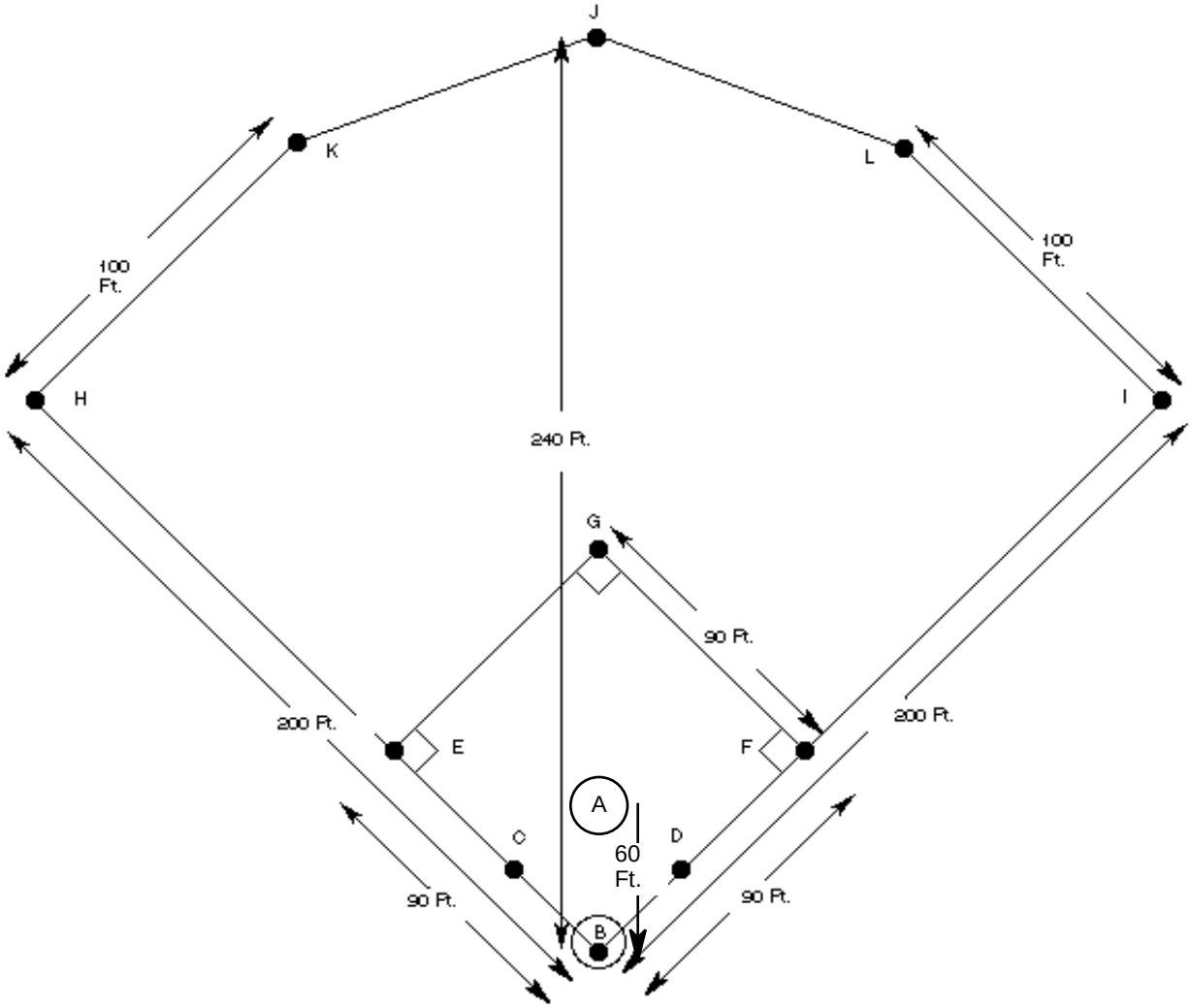
Cal Ripken of the Baltimore Orioles makes $5,300,000 a year playing baseball. If he plays 162 games a year, how much money does he make per game? You may use your calculator.
_____

Explain how you got your answer.
_____
_____
_____
_____
_____
_____

"Fund Our Field!"

Write a persuasive letter to the P.T.A. persuading them to fund the construction of your baseball field. They have agreed to spend their money on either a Math Club or the baseball field. You need to convince them that the baseball field would be the best choice. Support your opinion by listing at least five ways you used mathematics to plan your field and how mathematics is used in baseball.

"Ballfield Blueprint"



Baseballapalooza Teacher Resource #8

One Inch Grid Paper